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Analysis for Water Conflict Transformation

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Abstract

This article proposes and fleshes-out an analytical method designed to support efforts to transform inequitable and unsustainable transboundary water arrangements. Such 'transformative analysis' leverages socio-ecological thinking to critically evaluate the processes that have established and maintain an arrangement, including hydro-diplomacy itself. The benefits of transformative analysis include facilitation of i) interpretation of strategies to deflect transformation, ii) identification of destructive forms of cooperation, and iii) strategic classification of opportunities for transformation. The assertions are premised on an understanding of the particularities of water conflict, and followed by a discussion of ways researchers may overcome the challenges that are inherent with the method.

Water conflicts in the spotlight

At its broadest level, this article seeks to ensure that research is more relevant to efforts to improve environmental conflicts. Focusing the debates about the extent to which ‘the environment’ is a source of conflict (see Box 1) onto inequitable transboundary *water* arrangements, the article develops a method to help with their transformation. Though water often occupies central stage in the environmental conflict policy arena (Solow 2013), the bulk of water conflict research has proven to be of little effect in the diplomatic efforts to ease tensions and shape the institutions that govern international water sharing, not least of all along the Jordan and Nile rivers that are explored here.

If the goal of diplomacy is to render transboundary water arrangements more equitable and sustainable (and this is not always the case), the article argues, ‘transformative analysis’ must critically evaluate the processes that establish and maintain the arrangements. This is particularly so when there is a structured asymmetry in power (ie a context of hydro-hegemony), but it obliges overcoming the difficulties inherent with such politically-sensitive and interdisciplinary research.

Because the benefits of transformative analysis are so numerous that they can fill a book,¹ the focus here is on just a few: the benefits of in-depth case studies; the acute assessment of existing arrangements; the interpretation of strategies to deflect transformation; the identification of destructive cooperation; and the strategic classification of opportunities for transformation. The argument is premised on an understanding of the particular ways that humans use and fight over water and that a socio-ecological (or hydro-social) interpretation of water resources availability and use fits best with the practice of water conflict transformation, be it activism, counter-hegemonic movements, or inter-state negotiations.

The intended audience is other hydropolitical researchers and activist scholars that are aware of and care about the processes that may take up their research. It may come as little surprise to scholars of this Special Issue on hydro-diplomacy to read yet another endorsement of the benefits of leveraging the synergy that derives from blending disciplines and epistemologies (Max-Neef 2005)(see Box 2). It is still rare enough, however, for the environmental conflict and water policy research communities to be encouraged – as they are here – to combine hydro-geology with political ecology, International Relations and soils science, or to collect flow gauge data as complement to interviews, observations, and trawls through dusty archives. The challenges inherent with these data collection and analytical methods are compounded when water arrangements are so ‘securitized’ that transformation appears infeasible and data is not readily shared, but they can be overcome through careful design of the research and other manners discussed in the Conclusion.

¹ Indeed, transboundary analysis is further conceptualised and applied in detail in a comprehensive monograph Zeitoun et al. (forthcoming).

Definitions

A transboundary water *arrangement* is understood to mean the treaties, protocols, river basin commissions and other institutional structures that shape policy and use of transboundary waters (primarily) between states. *Inequitable* arrangements are those that lack key elements of a model arrangement, including fairness (as defined by the ‘equitable and reasonable’ principle of International Water Law). Such transboundary water arrangements are considered *unsustainable* by definition, in the sense that people will always seek to change inequitable situations, though the term is also discussed loosely in the sense of sustainable use. *Transformation* is understood to refer to structural changes in the processes that shape existing arrangements (primarily) between states over international watercourses. Not all transformation is ‘positive’ or desired by the majority of people involved; after all, re-arranging established arrangements of any sort can lead to a whole new set of tensions and/or unexpected outcomes.

The need for transformative analysis

Limitations of conventional analysis

The body of knowledge of transboundary water arrangements varies in form from policy-oriented reports or technical research that aims to enable more effective infrastructure or institutions from within existing arrangements (UNEP/MAP/MED POL 2005, e.g. Grey, *et al.* 2009, Pernetta, *et al.* 2012, EcoPeace 2015, Sadoff, *et al.* 2015) to sharply critical articles and investigating the roots of water conflicts (Suhardiman, *et al.* 2014, Menga, *et al.* 2016, Warner, *et al.* 2017). Like the reports, the peer-reviewed articles cannot fully conceal their objective of (somehow) ‘improving’ the transboundary water arrangement being examined – though this is always unstated. Another thing the disparate forms of literature have in common is their minimal influence over the processes that drive or sustain the conflictual arrangement they focus on.

Consider the relevancy of reams of conventional research on the asymmetric arrangements along the Jordan and Nile rivers and associated aquifers.² A great body of policy and academic research exists on both rivers, such that there is little contestation over the shares in control over the flows: roughly 90% and 85% by Israel and Egypt, respectively (NBI 2006, Zeitoun 2008, World Bank 2009, Granit, *et al.* 2010, Alatout 2011, NBDF 2011, Cascão 2014, Cascão, *et al.* 2016). Both transboundary water arrangements have drawn-in third parties to mediate, whether the American and European diplomatic interventions in the 1980s and 1990s in Jordanian-Israeli and Palestinian-Israeli discussions, or the World Bank and UNDP via the Nile Basin Initiative (NBI) and the Cooperative Framework Agreement. As elaborated in Zeitoun *et al.* (2019), each context has also been the stage for debate about the prevention, management, resolution or transformation of water conflicts. Neither

² Two of the authors have been directly involved in the related diplomatic processes for sustained periods of time.

arrangement has benefited from the reams of literature directed at it, though, at least not when considered in terms of equity or sustainability.

Policy reports have played their part, whether the DFID-supported groundwater mapping of the West Bank (SUSMAQ 2003), the Multilateral Working Group on Water Resources on the Jordan River (EXACT 2005), the many reports of the NBI Secretariat (NBI 2012, NBI 2016), or of the Eastern Nile Technical Regional Office (ENTRO). Work examining the biophysical or social impacts of dams along the Nile is equally relevant (Wheeler, *et al.* 2016, Siam, *et al.* 2017), and the body of work has certainly helped to forge a more comprehensive and common understanding of the biophysical parameters of the river basins and aquifers in questions, while the resultant transparency has served to dispel the contention over conflicting data sets that characterised the earlier decades of each conflict.

Too little of this work has been drawn upon by the social science community, however. The community has thus – generally – missed potential contributions to conflict transformation that might have come through consideration of the effective pollution filtering role that the karst limestone aquifer (along the Jordan) plays, as one example, or the amount of food produced through rainfed agriculture (in the upper Nile). Moreover, what the great bulk of conventional socio-political analysis on the Jordan has failed to do is examine the structural inequities that underlie the transboundary water governance arrangement (e.g. Lonergan, *et al.* 1994, Sherman 1999, Allan 2001, Brooks, *et al.* 2010, Feitelson, *et al.* 2017). If this body of work had done so, light would have been shed onto the risk of the Joint Water Committee becoming not a forum of model cooperation (as it had asserted), but an institution that very effectively restricted the development of Palestinian statehood (World Bank 2009), or served as a tool of Israeli colonization of the West Bank (Selby 2013). Socio-political analysis conducted prior to the dramatic 2010 changes on the Nile (Mason 2003, Kameri-Mbote 2006, Phillips, *et al.* 2009), meanwhile, managed to skirt the issue at the heart of the contentions – the 1959 Sudan-Egypt agreement that allocated the bulk of the flows to the latter (and none to any of the other riparian states). The issue of allocation was not forensically and methodologically excavated even though there were signs that the 1959 agreement would threaten inter-state relations during the decades of heightened NBI activity, and well before the beginning of the end of the NBI in 2007 (Cascão, in Zeitoun, *et al.* forthcoming 2018) the political revolution in Egypt in 2011, or Ethiopia's announcement of the construction of the Grand Ethiopian Renaissance Dam (GERD) less than a month later.

As such, and despite its many other merits, the bulk of socio-political analysis cannot claim to have made any significant difference to the transboundary water arrangements on either the Jordan or the Nile. With the benefit of hindsight, it is clear that first necessary (though not sufficient) steps would for social research to make more of the technical reports, to study power politics, or to incorporate complexity science (e.g. Jones 2015), amongst other oft-repeated pearls of wisdom. But if analysis is to be relevant to the inequitable transboundary water arrangements, it will have to go further – to understand and engage with

the processes and structures that maintain them, and identify potential for their transformation.

How a focus on conflict transformation can help

Looking at it broadly, the more conventional socio-political analysis seems well-suited for relevance to the practice of conflict *management*, whose goal is to avoid the degradation of water conflicts, especially to becoming overtly violent. The conceptions, analytical approaches and policy tools that are provided appeal to mediators keen to tweak or maintain an arrangement, such as state or corporate diplomats, activists, and lending banks (e.g. USACE 1996, Delli-Priscoli, *et al.* 2008, United Nations and World Bank 2018). The easy uptake into policy is lubricated at least in part by the tendency of the analyses to avoid the thorny political issues, or ‘upsetting the applecart’. An un-stated bias is set up, however, in not challenging the status quo, as the trade-offs and compromises managed by the third parties that make use of the analysis are more likely to originate from the narratives of the prevailing actors (see Zeitoun, *et al.* 2011, Zeitoun, *et al.* 2016). Even as the conflict is steered away from (open) violence, then, it is shepherded safely within the confines of the status quo that have been set by the more powerful actors – and the conflict lingers, neither significantly changed, nor resolved (Mirumachi 2018). Such perpetuation of the water conflict is especially troubling when water diplomacy is pursued with an expressed will to harmonise interventions with national security interests (e.g. CNA 2017: 4, EcoPeace-INSS 2018: 3). There is thus reason for concern about the assumptions that analysts make in regard to the role of third-party mediators, especially in a context of hydro-hegemony. The concern can be alleviated by an acknowledged awareness or at least more open treatment of the conflict management processes that the analysts contribute to.

By contrast, other protagonists in a conflict will foreground the thorny issues, and see any resolution of conflict necessarily emerging through a change to the status quo. In contrast to conflict management, the goal of conflict *transformation* is to replace an undesirable situation with one that is preferred (see Kriesberg 2009), ideally (if not practically) by all involved. Based on Lederach (2003, 2005), the core of the conflict transformation approach is a recognition that all political matters (such as water conflicts) are contentious and contestable, and *always will be*. Change in any arrangement is likely to favour some groups of people at the expense of others. Efforts to transform conflict thus require double the sweat that is spent on conflict management, as they will have to overcome predictable resistance from those powerful actors with a stake in the status quo.

Conflict transformation efforts nonetheless hold the potential to overhaul conflicts through constructive processes of change. The transformation could be of the actors, issues, rules or structures that maintain any arrangement (Väyrynen 1991 in Botes 2003), as seen at least in part in Northern Ireland, Sri Lanka, Bosnia-Herzegovina, Kosovo and Georgia (Mac Ginty 2014). As just one of many long-term benefits deriving from cases where the fundamental aspects of a conflict are actually transformed, the resultant arrangement creates stronger

relations between the actors, and liberates energies for more productive endeavours – which can be alluring propositions even to the more recalcitrant parties. Conflict transformation is worth the extra effort, in other words. But conflict transformation demands considerable skill and art from seasoned mediators – and a similarly appropriate analysis.

The premise of transformative analysis

The argument for the hydropolitical researchers to undertake transformative analysis could be premised on a case made of any combination of numerous factors that the body of knowledge has highlighted, including the multiple causes of conflict; perceptions of root causes; the importance of history and narratives; how water treaties can incorporate changes in water needs or availability, and many more. This section examines just three: the particularity of water conflicts, the reasons for their silent running, and the benefits of a hydro-social interpretation of water.

The particularities of transboundary waters shape the way it is contested

A comprehensive review of violent conflict (generally) finds it to be context-specific, multi-causal, and multi-dimensional, and the result of institutional, socio-economic, and resource and environmental factors (Haider 2014). Whether violent or not, *natural resource-related* conflicts typically exhibit qualities from each category, in different admixtures. All natural resources are used, valued, and fought over by humans in different ways, however, and a deep dive into the dynamics associated with the material aspects of the natural resources will be most relevant to any practice of conflict transformation.

The most distinguishing feature of water is its renewability from the atmosphere to the earth, and back again. Unlike forests, the cycle generally occurs at rate of months or hours, depending very much on climatic conditions and how water is used. It follows that concerns about biophysical scarcity of water (or abundance, in the case of floods) are about protection, equity of access, and rates of use, rather than water ‘running out’ at the global level. The global perspective has led to concepts that illuminate limits on some natural resources – e.g. planetary thresholds (Rockström, *et al.* 2009) and ‘peak water’ (Gleick, *et al.* 2010), but these add no clarity when applied to water use, where limits are determined and felt much more locally and in terms of shifting rates of change. All water resource concerns – and so contentions, and so conflict – are circumscribed by water use and whether it affects the users directly, and so can vary tremendously in shape and severity from the village to the continental level.³

Unlike diamonds and oil, furthermore, water is not ‘lootable’ in any meaningful volumes or economic value (see Le Billon 2006). In the quantities that it is coveted, water is too heavy

³ Refer to Box 1 for discussion of the lack of basis to the widely-held view that global water scarcity *itself* drives conflict.

and energy-consuming to be stolen, or converted into cash. The relatively minute economic value of water is particularly brief, and limited to its contribution to the value of the crops that it helps to grow or goods that it can help to produce. While an oil field can support entire state economies, including the very expensive war infrastructure usually required to justify a military battle or invasion, even the largest intensively irrigated and productive agricultural fields cannot.

Water conflicts run silent because of food imports and power plays

A thorough review of contests over international transboundary waters finds they are driven by struggles for control, access and use, or connection with national identity (Haftendorn 2000, Ruettinger, *et al.* 2011). Unlike most of the public attention and resistance given to the construction of dams, tensions over international water conflicts rarely manifest themselves in violent terms, and so can be considered somewhat ‘hidden’, or invisible, or at least silent. Analysis will have to draw on the best of economics, agronomy, sociology and hydrology and others, if it is to begin to identify and interpret the key elements of water conflicts.

Consider the option that most governments have to import food, often cited as one factor explaining the silent nature of water conflicts (Allan 2002). Importing food grown with water in another country – or ‘virtual water’ (Allan 2011) – means that a national government can use less of water within its territory, or use such water for other activities that bring higher economic returns (i.e. using water for industry rather than for agriculture – see Barnaby (2009)). In this way, water is replaceable (or ‘fungible’, in the language of International Relations), and food imports act as a valve that relieves the pressure on the local water resources that would otherwise be used. The Nile conflict would likely be much more acute, for instance, if the government of Egypt did not have the option to import wheat or beef from Russia, Argentina, or Sudan through long-established trading arrangements.

Transboundary water conflicts are also somewhat hidden because they are determined in large part by the asymmetry in power between the riparian states. Consider the fact that there is no instance of a water-sharing arrangement that is both inequitable and in favour the less powerful actor. Many of the inequitable arrangements are ‘hegemonic’, furthermore, meaning they are maintained both by the use (or threat of the use) of force by the more powerful actor, as well as the *consent* of the less powerful actor (Zeitoun, *et al.* 2006).

That power has many forms, and some of it operates very subtly – particularly the ‘soft’ power that can result in unexpressed contestation of the arrangement (Zeitoun, *et al.* 2016). It follows that formal governmental consent to any arrangement might be tactical or strategic – like Ethiopia’s participation in the NBI processes, before it began to more openly contest the Nile arrangement, or enduring Palestinian participation at the Joint Water Committee (Selby 2007). Tensions can indeed be difficult to detect if drawing attention to them is not in the interest of the more powerful actors and the arrangement is openly

consented to by the less powerful actor, if the effects of power asymmetry are not explicitly sought by the analyst.

Hydro-social thinking is more illuminating

Because the effects of scarcity of water plays out in society, as previously discussed, a strictly biophysical interpretation of any transboundary water arrangement will reveal less than half of the picture. A further reason that biophysical scarcity is not (necessarily) a driver of conflict, is because scarcity is relative. Water scarcity is a function of water need, in other words, whether that need be human, animal, or environmental. If there was no 'need' for water (in a desert, say), there would be no 'scarcity', in the social sense of the term.

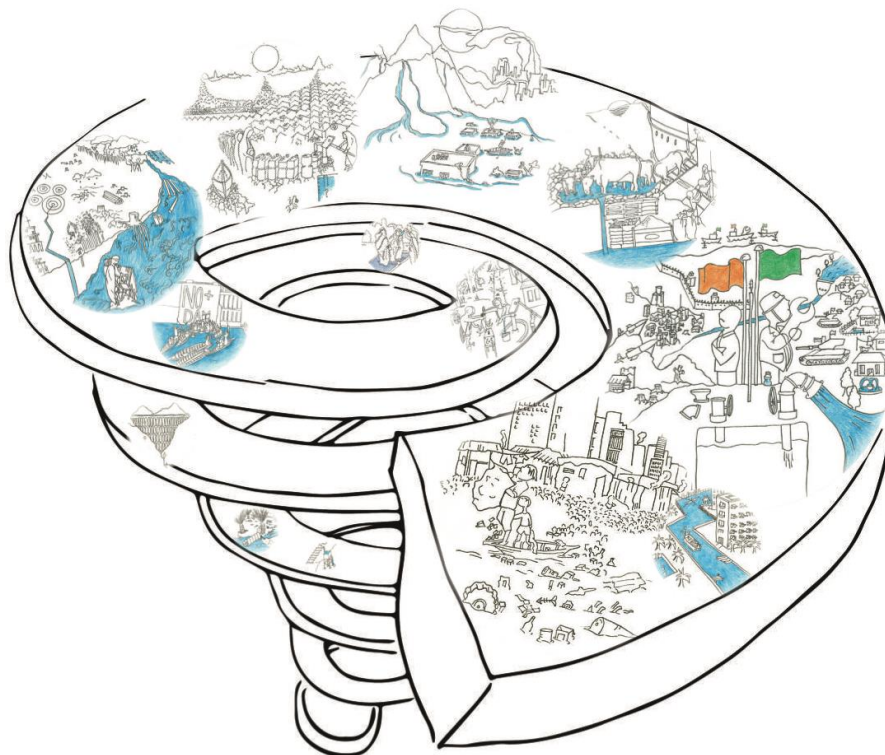
The need for water can be created, furthermore (see Mehta 2011), as demonstrated by the well-known case of asparagus grown in the Ica/Huanica Valley in coastal Peru for consumption in Europe. The asparagus spears are pushed out of the sands with the utmost efficiency (through drip irrigation), and sold the world over. Growers have achieved such a high irrigation efficiency rate, that they have managed to divert the headwaters of the Amazon to sustain expansion their farms, once the groundwater table had been abstracted beyond the feasible limits of the pumps (Hepworth, *et al.* 2010). Where and how water the river and groundwater are used are as much a function of the political economy driving European 'need' for asparagus, then, as they are of the sunshine. Export-bound herbs grown in Israel and rice grown in Egypt are similar cases of 'desert bloom syndrome', to use Molle et al's (2008) term. Power and power asymmetry underlie how and when water is allocated, linking strategies and tactics of hydro-hegemony conveniently with hydro-social interpretations of water resources. Greening a desert is simple, and profitable enough, but not environmentally sustainable. It *is* politically sustainable, unless the flows come from a transboundary resource that is contested by neighbours.

'Sustainable' is itself a contested term, of course. Like water scarcity, sustainable levels of water use are very much determined water use and need. Hydrology and hydro-geology help to define limits that can be placed on abstractions, and any transboundary water arrangement would benefit from a solid understanding of the long-term average volume of river flows, and the extent to which they are seasonal or changing with climate (Taylor 2009, Jarvis 2019). But it is no mean feat for transformative analysis to interpret the 'sustainable' limits of a river or an aquifer. The analytical task is particularly problematic for aquifers, because often, the more groundwater that is pumped out of an aquifer, the more water rushes in from adjoining ones.⁴ The task is more difficult still when the hydraulic connections of the aquifer pass under political borders – and there is no study that has robustly quantified transboundary groundwater (including in the West Bank, despite the relatively great number SUSMAQ studies), nor is there even an agreed methodology to do so.

⁴ Any idea of a 'safe yield' from an aquifer is thereby considered a "myth" (Jarvis 2014).

Such assertions in no way discount the importance of conventional hydrological and hydrogeological methods of calculating water availability. Logic does oblige expanding beyond them, however. When it comes to incorporating sustainability and scarcity into transformative analysis, the classic concept of the hydro-cycle is a hindrance more than a help. Because the classic concept presents the movement of water from cloud to earth as devoid of human influence, it leads conceptualisation away from the processes that stem from constantly changing features of society and the economy. A much more effective way of getting to the root of any sort of sustainable limits is via the ‘hydro-social cycle’ (Linton 2010) or through the hydro-social *spiral* shown in Figure 1, as this addresses the false sense of stability that a cycle implies (Farnum, *et al.* 2018). Rooted in the socio-ecology tradition, the concept of the hydro-social cycle emphasises that analysts really cannot and should not attempt to separate water resources from water use. The implications for transboundary water arrangements are clear: groundwater pumping that induces lateral flows across a border (as in the A7/B2 Aquifer that lies partially under the hydrological basin of the Yarmouk tributary to the Jordan, in Syria and Jordan (UEA 2018)), like the export of food out of the basin they are produced in, are further relevant components of the water conflict that must therefore be factored into transformative analysis.

Figure 1. Farnum, Thompson and MacDougall’s *hydro-social spiral*. Drawing attention to both the high degree of instability and its human drivers, the spiral provides a more stable foundation of understanding upon which conflict transformation efforts may be built. (Farnum, *et al.* 2018). **Hi-res version to be provided prior to publication.**



The benefits of transformative analysis

If transformative analysis is to render transboundary water arrangements more equitable and sustainable, it must leverage the best of socio-ecological/hydro-social thinking to critically evaluate the processes that establish and maintain them. As discussed following, the benefits of doing so include the useful assessment of existing arrangements, interpretation of strategies to deflect transformation, identification of destructive cooperation, and the strategic classification of opportunities for transformation.

First benefit: Useful assessment of existing arrangements

Though it may be straightforward to identify the *inequitable* and *unsustainable* parts of any transboundary water arrangement, specifying what an improved arrangement looks like is much less so. Does the arrangement require an international agreement, for example, how will the new arrangement adapt to future changes, and how ‘fair’ is it in the first place?

Where a transboundary water arrangement is regulated by an international agreement, the agreement in question is readily assessed by comparison with the key features identified by analysis done on model water agreements and treaties. A wide variety of perspectives have weighed-in on the task, emphasising that resilient agreement should cover conjunctive use of groundwater and surface water, strong institutional mechanisms (such as joint committees and dispute resolution mechanisms), and provisions to maintain water quality and ecosystem integrity (see e.g. Conca 2006, UNECE 2013, Dinar, *et al.* 2015).

A particularly robust transboundary water agreement would be able to adapt to circumstances that are different than they were at the time of signing, whether that be reductions in water availability due to climate change (Jafroudi 2018), or increased demand for water due to sudden increases in population (as in Jordan, due to the influx of people fleeing the war in neighbouring Syria (Muller, *et al.* 2016)). Adaptability can be relatively easily written into a treaty through ‘re-visiting clauses’, as with the case of the Columbia River treaty that triggered its review forty years later, in 2016, and likely re-negotiation (Cosens, *et al.* 2012). It is of course never certain that the political will and foresight that existed at the time of concluding an agreement will be present at the time its designated re-negotiation.

Analysis that can transform an arrangement would do well to investigate a further notable aspect of a model treaty: the quality of its allocation mechanism. This relates to the ‘equitable’ part of the definition of a desired transboundary water arrangement, and may be most readily gauged by comparing it to International Water Law (IWL), particularly as codified in the 1997 UN Watercourses Convention (UNWC). The share of control and use of the transboundary flows stipulated by IWL is referred to as the ‘legal entitlement’ of each state, and – for all its limitations (D'Souza 2010) – may be the least worst way for analysis to evaluate the fairness of an allocation mechanism, or actual distribution of use or control over the flows. The legal entitlement is defined through the obligation that states use

international watercourses in an “equitable and reasonable” manner. ‘Equitable’ is used in contrast to equal here, for explicitly acknowledging that use of a transboundary watercourse is not necessarily best split in identical shares between the many states may make a claim to the watercourse. The analysis required to interpret the legal entitlement is relatively straightforward, a matter of quantifying economic needs and access to alternative water sources, as explained in the UNWC *User’s Guide* (Rieu-Clarke, *et al.* 2012), and applied in the cases of the Jordan and Nile watercourses (Moussa 2013, Quba’a, *et al.* 2017), amongst countless others. Such quantification is quickly taken up by different actors pushing for transformation, even if IWL itself is no less immune to the vagaries of power that ultimately determine most arrangements in hegemonic settings.⁵

Second benefit: Interpretation of strategies to deflect transformation

Compromise on water conflicts can be very difficult for state actors or negotiators, because water issues are frequently wrapped up with national identity, and readily framed in terms of national security. The official view of sequential governments in Egypt, for instance, was that any upstream development on the Nile would threaten the political existence of the country (Allouche 2004). In a country that receives almost no rain and which hosts millions of farmers dependent on the river for their living, the assertion can to be taken up by citizens and residents – even if it makes no account for food imported or exported, or soil water, or the very many other issues that comprise a state’s integrity (identity, military, history, etc.).

Framing water issues in existential terms serves to foreclose normal political discussion – and has been labelled ‘securitization’ (Buzan, *et al.* 1998). Once waters are securitized, the concession and compromise required for alterations to a transboundary water arrangement is difficult to achieve (Mirumachi 2013), and obliges for the diplomat the task of de-securitising (see Weinthal, *et al.* 2015). The upper and Yarmouk tributaries of the Jordan River are examples of water issues that are so politically heightened that even basic hydrological data (in Syria, and, to a lesser extent, Israel), is hidden, and discussion of equitable sharing a sure exit point to deliberations (2015, UEA 2018, Wine 2018).

One way for the analyst to help de-securitise⁶ is by exploding the underlying logic upon which securitised assertions are made. The task of the transformative analyst thus becomes, for example, to expose the dissonance between the claims of those who securitize, and the

⁵ Amongst several other obligations, the UNWC asserts that all states have a ‘duty to cooperate’ which obliges all parties to do so on the basis of “sovereign equality, territorial integrity, mutual benefit, and good faith”. Precisely because it applies to hegemonic actors who may be resistant to changes in the arrangement, the ‘Duty of Cooperation’ has been considered the main obligation through which IWL has the potential to address power asymmetries by ‘levelling the playing field’, thereby giving the possibility of transforming the conflict (Farnum, *et al.* 2017).

⁶ De-securitization tactics can follow many strategies (Buzan, *et al.* 1998, Roe 2004) that have been identified in relation by Biba (2016) to transboundary water arrangements on the Mekong as: *passive recipient strategy* (ignoring the securitizing moves until they abate or stop), *blocking strategy* (asserting the issue as not securitized), or *active reshaping strategy* (essentially, the blocking strategy complemented by action to incorporate the securitizing actor’s concerns).

national 'need' for water in terms of availability and use of water. The transparency created by basic hydrology, hydro-geology, and political economics are useful here, in the way that the technical reports in the Jordan and Nile cases served to shift the debates over numbers, as previously discussed. Such analysis could be extended to investigate the extent of pressure that food imports relieve of local water resources, or the corresponding stress induced by food exports. An assessment of the legal entitlement and inevitability of development of upstream states would also serve to desecuritize – and might help all involved to begin to anticipate tensions in a way that enables pro-active adaptation to them (see e.g. Weinthal, *et al.* 2015), and/or develop workarounds.

Like any environmental issue, furthermore, water conflicts are also prone to being framed as 'non-issues'. The term a-politicisation, or 'naturalisation' (Forsyth 2003) is used to identify the attribution of political issues to 'natural' causes. One very commonly seen form of naturalisation is the attribution of blame for problems created by unsustainable water policies on climate change. Such mis-placed accountability thus removes the (human-made) water policies from any potential solution, and this can be just as debilitating as the securitisation of a conflict. Steps towards transformation are impeded because deliberation about their human causes (the ones that can be 'worked on') is, at the very least, discouraged. The focus on the effects of climate change on the Eastern Nile or Jordan are evidence of the uptake (Rimmer, *et al.* 2011, Conway 2017). The task of the transformative analyst in this situation is to provide a rigorous base of evidence upon which discussion and policy or diplomacy may ensue. Technical studies are often seen by policy-makers as 'safe' ways into politically-sensitive subjects, and utilising data and information to build a case to revisit such problems created by water policies can be a first step in the right direction – so long of course as the technical analysis does not displace the blended hydro-social analysis, or avoid the thorny issues. Analysis that exposes such naturalisation would also serve to re-focus on the sources of the problem, and of the solutions.

Third Benefit: Identification of destructive cooperation

Like a caterpillar morphing into a butterfly, 'conflict' can be a necessary step towards equitable and sustainable transboundary water arrangements. Openly-expressed disagreement can be constructive, in other words, when it leads issues onto a stage where they can be dealt with. In contrast to such constructive conflict, some cooperation can be problematic. Like the prisoner ordered to 'cooperate' by the guard that is seeking to extract information, or an employment contract signed under duress, cooperation can be coercive; it can even be downright ugly.

Skewed transboundary water treaties can be the result of this type of cooperation. The work on model water agreements has found the skew to be the result of deliberate ambiguity in the clauses, for example, or inequitable allocation mechanisms and misleading communications (see e.g. Zentner 2012, Dinar, *et al.* 2015). When the skew favours the basin hegemon, and is consented to by a marginalised weaker party, the agreement

becomes an effective tool to maintain the (similarly asymmetric) transboundary water arrangement – as with the 1994 Jordan and 1959 Nile agreements. With the passage of time, changed circumstances, and growing awareness, these agreements became a more visible source of conflict, as was the case with the 1994 OKACOM Agreement in southern Africa (Davidsen 2006, Carles forthcoming 2019), between Brazil and Paraguay on the Paraná River [get year and date of the treaty], and the 1996 Ganges Treaty (Thomas 2017).

Detecting the skew in a treaty requires analysis of its clauses, just as evaluation of the form of cooperation in any arrangement obliges examination of the outcome. The trap of missing destructive cooperation or of mistaking it for something more ‘positive’ may also be avoided if analysts define what is meant by ‘cooperation’,⁷ and evaluate the coordination observed between the parties against it.⁸

Fourth benefit: Strategic classification of opportunities for transformation

Particularly when an inequitable transboundary water arrangement is resistant to change (whether due to hegemony, securitisation or naturalisation), analysis that is to be relevant must identify opportunities for transformation. The more that the analysis is able to develop s opportunities into a strategy, the more relevant it will be, still. To borrow a concept from negotiations theory, a strategy to encourage opportunities for transformative analysis would put more options on the negotiations table, and make the ‘solutions pie’ bigger.

The default source of opportunities is the alternative ideas, visions, and narratives that are not picked up by conventional hydropolitical or technical analysis, because of the dominance of the prevailing narratives about the conflict, as previously discussed. Put another way, ideas about transformation can come from left field, or from the less powerful voices, and so should be sought there. The fertile ground for options for transformation is to be found in the non-hegemonic states, then – and perhaps even more so in the trans-national coordination between groups in civil society.

Windows of opportunity can open with sudden changes in climate or political regimes, or with the development of a new water technology or irrigation techniques. One common form of opportunities is the benefits produced by the rivers or aquifers (Sadoff, *et al.* 2002), notably hydro-electricity, or food. A secure food or oil import agreement has the potential to take the stress off of the securitised freshwater, for instance, just as would the sale or exchange of electrical power – notwithstanding the risks of inducing naturalisation processes, or those associated with increased dependency on other countries and decision-makers beyond one’s control. Changes to the political economic structures within which the water conflict plays out (e.g. international food or energy or geopolitical arrangements) thus have the potential to be truly transformational, and could be assisted by the quantification

⁷ A Typology of ‘cooperation’ is offered in Zeitoun *et al* (2019).

⁸ A particularly useful tool for this is the *Transboundary Water Interaction Nexus* (Mirumachi 2015), which defines intensities of cooperation and conflict, pits them against each other, and permits visual interpretation of the dynamics that maintains any arrangement (or that may allow it to transform).

of virtual water flows, for example, or practical application of the more critical research on water-energy-food nexus work (Mayor, *et al.* 2015).

A number of inter-disciplinary methods on offer to the transformative analyst for exploring benefits. The *Transboundary Water Opportunity* analysis derives the 'benefits wheel' which seeks to combine the hydrological and biophysical understandings of the water with poverty reduction, agricultural activity, and political stability (Phillips, *et al.* 2010). Building on this, and the most tangible policy outcome of hydro-social thinking, the *Quantitative Water Allocation Framework* fleshes-out the benefits / from agriculture and industrial development, to the energy and domestic water sectors, and environmental flows reserved for 'nature' (Phillips, *et al.* 2017, Woodhouse, *et al.* not published). Each of these types of benefits are associated explicitly with many forms of water, be it surface, groundwater, soil water or virtual water.

Proceed with consideration

As it has been sketched-out, transformative analysis obliges leveraging of the synergy that derives from blending disciplinary approaches and epistemologies. All the common risks associated with such blending apply here, including disciplinary dominance, epistemological dissonance, and specialist journals and funding streams that are designed to discourage it (Max-Neef 2005, Miller, *et al.* 2008). The politically-sensitive nature of natural resource conflicts ensures that transformative analysis presents additional difficulties of its own.

By definition, the study of conflict is relevant to all those invested in the conflict. It is no surprise to find that data can be difficult to acquire from ministries intent on maintaining the current form of any arrangement. Especially when a water conflict is securitised, the trust (of the researchers, or between protagonists) required for effective analysis can be as low as the pressure to conform and censure findings is high. The potential peril is that the practice of conflict transformation will be based on partial or superficial analysis, as highly complex water issues are simplified, or too much is extrapolated from too little.

The analyst has three broad ways to deal with such difficulties. The first is to resist the analysis of a situation that the individual or research team does not and cannot know much about within the time limits of the research project. Researchers that are not 'plugged in' to the networks of decision-makers are likely to miss a big part of the picture, or re-present the aspects most convincingly presented to them, whether intentionally or unintentionally.

The second workaround is the flip-side of the first: ensure that the analytical team has the insight, personal networks, and trust that will enable sharp and sound analysis. This includes the ability to interview in the language of key informants, and thus to interpret a wide variety of media sources and archives. Being an 'insider' carries its own risks of bias. A research team must do better than to simply have one or two members from various perspectives of any conflict. The process of research needs to expose and grapple with

disciplinary biases and blind spots, by creating spaces where differences can be fleshed out common ground can be found (perhaps at research workshops). Ideally, each team member should have the same commitment to an equitable transboundary water arrangement – and thus be able to acknowledge and so rise above any disabling biases. When this is not possible, as in most cases, biases can be declared. Just as hydrologists have been called to come clean on the limitation of their models (Beven 2008), so transboundary water conflict analysts would do well to define what they mean when they use the terms ‘cooperation’, and ‘inequitable’. The quality and potential bias of the work would be that much easier to judge, at the very least.

The third way to work around the risks of transformative analysis is to bound the limits of the research clearly. Some policy reports tend to mislead through confident but poorly-founded recommendations, and may be driven to try out new concepts and tools as one-stop shops for the management of water conflicts (e.g. USAID 2012). The temptation to over-stretch conclusions or to generalise can be replaced by stipulation of the applicability of the findings, instead.

Specifying the utility of the analysis is key to its practical application. Beyond the general guidance this article has provide – in a nutshell: employ a hydro-social approach to critically evaluate the processes that establish transboundary water arrangements – the most useful transformative analysis will result from deep case studies that are likely to have limited applicability elsewhere. It is up to the research team to tailor their research to be relevant to the transformation of the natural resources and to the conflict at hand.

Box 1: There can be smoke without fire, and other concerns with the search for causation

Environment-conflict debates often centre on causation: to what extent is the violence in Africa associated with or due to high temperatures (Buhaug 2010), for example, or the war in Syria caused by drought (Selby, *et al.* 2017)? The very different answers that are arrived at reflect the epistemological grounding of positivists and those who accept the complexity (see Le Billon 2001), or the methods employed by the ‘quants’ and ‘quals’ (as Solow (2013) refers to them).

There is good reason to reflect critically and take a position on the debate. The (very) dry climate of Darfur is insufficient basis for even assuming a link with the violence, to take one example. Consider how seriously Irish or British researchers would take the findings of researchers trawling for causal links between Ireland’s ‘Troubles’ and its cold and wet climate – especially if the analysis fails to consider how people have adapted to their natural setting (e.g. cooking and heating with peat). Apart from being wary of the ever-present danger of mistaking statistical co-relation for causation, it is also crucial to review Darfur – or indeed any setting - on its own terms (Bromwich 2017).

Box 2: How very different views of 'reality' affect interpretation of environmental conflict

On one end of the environmental conflict research spectrum is a community of strong environmental determinists. Researchers from this group assume and assert that water scarcity (or flooding) will lead to violence (or peace). At the very least, such thinking dismisses the hundreds of other inter-related reasons that people make war or peace (Roe 2004, Klare 2008), and their ability to adapt (and well) to changes in water availability.

Of much more potential use is the work of those who acknowledge that water is one component of conflict, often seeing it either explicitly or implicitly as a 'threat multiplier'. This broad group sees knowledge as objective and ever-evolving, generally holds a positivist ontology or view of 'reality', and typically includes traditional environmental scientists but also social scientists. A tendency to determinism may be driven by traditional disciplinary methods of enquiry and hypotheses applied to the extremely complex, and largely separate topics of war, and water. For example, hydrologists and agronomists join economists to test if there is a role of drought in the Syrian crisis (e.g. Muller, *et al.* 2016). Political scientists, too, trawl databases to spot correlations between size of state, length of river as border, etc. (though generally all of the links found to present are not statistically significant (see e.g. Gleditsch, *et al.* 2006)). The unstated expectation is that some objective version of the 'truth' about water and conflict will be reached, as datasets improve and hypotheses are tweaked.

As Selby (2017) argues, however, analytical treatment of the environment as a potential 'threat multiplier' is neither cautious nor rigorous. Analysts from a third group understand the knowledge that people create to be the result of narratives, ideas, myths and interpretations of history, and tends to eschew causal or binary links for deeper examination of the source of tensions between people and/or social institutions (e.g. Dalby 2006). This group typically has a critical realist perspective on 'reality' and are traditionally social scientists, though are increasingly joined with broad-visioned environmental scientists. The focus is on the interplay of the many facets that make up a conflict, or at least those that initial or previous enquiries have deemed to be the most important. Emphasis is placed on understanding cases rather than global or regional patterns, and on evidence and argument, rather than on testing statistical associations for causal relations. Questions are more typically open-ended rather than hypothesis-driven. In the case of Syria, for example, this means researching how water use has changed through the decades, and the establishment of long-term hydro-political baselines (Phillips 2010, de Châtel 2015, UEA 2018). Importantly, the group accepts that the 'truth' about an environmental conflict is so subject to people's perspectives and emotions that it is likely never to be known, and so there may never be proof of a determining relation between water and war.

References

- Alatout, Samer (2011). "Hydro-Imaginaires and the Construction of the Political Geography of the Jordan River: The Johnston Mission, 1953-56."
- Allan, J.A. (2001). *The Middle East Water Question: Hydropolitics and the Global Economy*. London, UK, I.B. Tauris.
- Allan, J.A. (2002). "Hydro-Peace in the Middle East: Why no Water Wars? A Case Study of the Jordan River Basin." *SAIS Review* XXII(2 (Summer-Fall 2002)): 255-272.
- Allan, Tony (2011). *Virtual water: tackling the threat to our planet's most precious resource*. London, I.B. Tauris.
- Allouche, Jeremy (2004). *Water Nationalism: An explanation of the past and present conflicts in Central Asia, the Middle East and the Indian Subcontinent?* Institut universitaire de hautes études internationales. Ph.D. Thesis. Université de Genève, Geneva, Switzerland.
- Barnaby, Wendy (2009). *Do nations go to war over water?* *Nature*. **458**: 282 - 283.
- Beven, Keith (2008). "On doing better hydrological science." *Hydrological Processes* 22: 3549 - 3553.
- Biba, Sebastian (2016). "From securitisation moves to positive outcomes: The case of the spring 2010 Mekong crisis." *Security Dialogue* 47(5): 420 - 439.
- Bromwich, Brendan (2017). "Power, contested institutions and land: repoliticising analysis of natural resources and conflict in Darfur." *Journal of Eastern African Studies*.
- Brooks, David and Julie Trottier (2010). "Confronting water in an Israeli-Palestinian peace agreement." *Journal of Hydrology* 382: 103 - 114.
- Buhaug, Halvard (2010). *Climate Not to Blame for African Civil Wars*. Climate Change and Security conference, Trondheim, Norway, 21 - 24 June 2010.
- Buzan, B., O. Wæver and J. de Wilde (1998). *Security - A New Framework for Analysis*. London, UK, Lynne Rienner Publishers, Inc.
- Carles, Alexis (forthcoming 2019). *Hydro-hegemonic tactics in a symmetric configuration: the case of Botswana on the Okavango*. Transforming Water Conflicts. Oxford, Oxford University Press.
- Cascão, Ana Elisa (2014). *Countering Hydro-Hegemony in the Nile Basin*. Presentation given at Seventh International Workshop on Hydro-Hegemony, 12/13 May 2014, London UEA Water Security Research Centre / London Water Research Group.
- Cascão, Ana Elisa and Alan Nicol (2016). "GERD: new norms of cooperation in the Nile Basin?" *Water International* 41(4): 550 - 573.
- CNA (2017). *The Role of Water Stress in Instability and Conflict*. CRM-2017-U-016532. Arlington, VA, CNA.
- Conca, Ken (2006). *Governing Water: Contentious Transnational Politics and Global Institution Building*. Cambridge, MA, USA, Massachusetts Institute of Technology Press.
- Conway, Declan (2017). "Water resources: Future Nile river flows." *Nature Climate Change* 7(5): 319-320.
- Cosens, Barbara A. and Mark Kevin Williams (2012). "Resilience and Water Governance: Adaptive Governance in the Columbia River Basin." *Ecology and Society* 17(4).
- D'Souza, Radha (2010). *Law and 'Development' Discourses About Water: Understanding Agency in Regime Changes*. *Water Governance in Motion: Towards Socially and Environmentally Sustainable Water Laws*. Cullet, P., A. Gowlland-Gualtieri, R. Madhava and U. Ramanathan. Bangalore, Cambridge University Press India Pvt. Ltd.
- Dalby, Simon (2006). *Security and Environment Linkages Revisited*. *Globalization and Environmental Challenges: Reconceptualizing Security in the 21st Century*. Gunter Brauch, H., U. Oswald Spring, C. Mesjasz, J. Grin, P. Dunnay, N. Chadha Behera, B. Chourou, P. Kameri-Mbote and P. H. Liotta. Heidelberg, Springer. 165 - 172.
- Davidson, Pål Arne (2006). *The Making and Unmaking of the Politics of Exceptionality: Studying Processes of Securitisation and Desecuritisation in the Orange and Okavango River Basins*. Master's thesis for the Institute of Comparative Politics. University of Bergen, Bergen.
- de Châtel, Francesca (2015). *Leaving the Land: The Impact of Long-term Water Mismanagement in Syria*. *Water Scarcity, Security and Democracy: a Mediterranean Mosaic*. de Châtel, F., G. Holst-Warhaft and T. Steenhuis. GWP-Med and Cornell University.
- Delli-Priscoli, Jerome and Aaron Wolf (2008). *Managing and Transforming Water Conflicts*. Cambridge, Cambridge University Press.

- Dinar, Shlomi, David Katz, Lucia De Stefano and Brian Blankespoor (2015). "Climate change, conflict, and cooperation: Global analysis of the effectiveness of international river treaties in addressing water variability." *Political Geography* 45: 55-66.
- EcoPeace (2015). Regional NGO Master Plan for Sustainable Development in the Jordan Valley: Final Report - June 2015. TelAviv, EcoPeace Middle East.
- EcoPeace-INSS (2018). Israeli Water Diplomacy and National Security Concerns. Eran, O., G. Bromberg and G. Giordano, EcoPeace Middle East, and The Institute for National Security Studies.
- EXACT (2005). *Groundwater Recharge*, Water Data Banks Project, Multilateral Working Group on Water Resources, Middle East Peace Process - Overview of Middle East Water Resources. <http://exact-me.org/overview/p12.htm>
- Farnum, Rebecca L., Stephanie Hawkins and Mia Tamarin (2017). Hydro-Hegemons and International Water Law. *Routledge Handbook of Water Law and Policy*. Rieu-Clarke, A. London, Routledge. 297 - 310.
- Farnum, Rebecca, Charles Thompson and Ruth MacDougall (2018). Re-envisioning the Hydro Cycle: The Hydrosocial Spiral as a Participatory Toolbox for Water Education and Management. *Water, Meaning and Creativity: multidisciplinary understandings of human-water relationships*. Roberts, E. and K. Phillips. London, Routledge.
- Feitelson, Eran and Amit Tubi (2017). "A main drier or an intermediate variable? Climate change, water and security in the Middle East." *Global Environmental Change* 44: 39 - 48.
- Forsyth, Tim (2003). *Critical Political Ecology - The Politics of Environmental Science*. London, UK, Routledge.
- Gleditsch, Nils Petter, Kathryn Furlong, Havard Hegre, Bethany Lacina and Taylor Owen (2006). "Conflicts over shared rivers: Resource scarcity or fuzzy boundaries?" *Political Geography* 25: 361 - 382.
- Gleick, Peter H. and Meena Palaniappan (2010). "Peak water limits to freshwater withdrawal and use." *Proc Natl Acad Sci U S A* 107(25): 11155-62. <https://www.ncbi.nlm.nih.gov/pubmed/20498082>
- Granit, Jakob, Ana Cascao, Inga Jacobs, Christina Leb, Andreas Lindstrom and Mara Tignino (2010). The Nile Basin and the Southern Sudan Referendum. Regional Water Intelligence Report- Paper 16. Stockholm, Stockholm International Water Institute.
- Grey, David, Claudia Sadoff and Genevieve Connors (2009). *Beyond the River: A Practical Perspective. Getting Transboundary Water Right: Theory and Practice for Effective Cooperation* Jagerskog, A., M. Zeitoun and A. Berntell. Stockholm, Stockholm International Water Institute.
- Haftendorn, Helga (2000). "Water and international conflict." *Third World Quarterly* 21(1): 51 - 68.
- Haider, Huma (2014). *Conflict: Topic Guide*. Revised edition with Brigitte Rohwerder, GSDRC, University of Birmingham.
- Hepworth, Nick, Julio C. Postigo and Bruno Güemes Delgado (2010). *Drop by drop: A case study of Peruvian asparagus and the impacts of the UK's water footprint*. London, Progressio, in association with Centro Peruano De Estudios Sociales, and Water Witness International.
- Jafroudi, Maryam (2018). "Climate change and accommodation of water availability in transboundary rivers: lessons learned from the Guadiana basin." *Water Policy* 20: 203 - 217.
- Jarvis, Todd (2019). The problems with transboundary groundwater. *Transforming Water Conflicts*. Zeitoun, M., N. Mirumachi and J. Warner. Oxford, Oxford University Press.
- Jarvis, W. Todd (2014). *Contesting Hidden Waters: Conflict resolution for groundwater and aquifers*. Routledge.
- Jones, Dan (2015). "Wars Without End." *Nature* 519(March): 148 - 150.
- Kameri-Mbote, Patricia (2006). *Water, Conflict, and Cooperation: Lessons from the Nile River Basin*. No. 4 in the Navigating Peace series, Woodrow Wilson International Center for Scholars, Environmental Change and Security Programme, January 2007.
- Klare, Michael (2008). *Rising Powers, Shrinking Planet: How Scarce Energy is Creating a New World Order*. Oxford, Oneworld.
- Kriesberg, Louis (2009). *The Evolution of Conflict Resolution*. The Sage Handbook of Conflict Resolution. Bercovitch, J., V. Kremenyuk and W. I. Zartman. Thousand Oaks, CA, Sage.
- Le Billon, Phillippe (2001). "The political ecology of war: natural resources and armed conflicts." *Political Geography* 20: 561 - 584.
- Le Billon, Phillippe (2006). *The Geopolitical Economy of 'Resource Wars'*. The geopolitics reader (Second edition). Ó Tuathail, G., S. Dalby and P. Routledge. Originally published in Geopolitics (2004). London, Routledge.
- Lederach, John Paul (2003). *The Little Book of Conflict Transformation*. Intercourse, PA, Good Books.
- Lederach, John Paul (2005). *The Moral Imagination: The Art and Soul of Building Peace*. Oxford, Oxford University Press.

- Linton, Jamie (2010). *What is Water?: The history of a modern abstraction*. Vancouver, University of British Columbia Press.
- Lonergan, Steve and David Brooks (1994). *Watershed: The Role of Fresh Water in the Israeli-Palestinian Conflict*. Ottawa, Canada, International Development Research Council.
- Mac Ginty, Roger (2014). "Everyday peace: Bottom-up and local agency in conflict-affected societies." *Security Dialogue* 45(6): 548-564.
- Mason, Simon A. (2003). *From Conflict to Cooperation in the Nile Basin: Interaction Between Water Availability, Water Management in Egypt and Sudan, and International Relations in the Eastern Nile Basin. Conflict Sensitive Interviewing and Dialogue Workshop Methodology*. Swiss Federal Institute of Technology Zurich.
- Max-Neef, Manfred A. (2005). "Foundations of transdisciplinarity." *Ecological Economics* 53(1): 5-16.
- Mayor, Beatriz, Elena López-Gunn, Fermín I. Villarroya and Esperanza Montero (2015). "Application of a water–energy–food nexus framework for the Duero river basin in Spain." *Water International* 40(5-6): 791-808.
- Mehta, Lyla, Ed. (2011). *The Limits to Scarcity: Contesting the Politics of Allocation*. London, Earthscan.
- Menga, Filippo and Naho Mirumachi (2016). "Fostering Tajik Hydraulic Development: Examining the Role of Soft Power in the Case of the Rogun Dam." *Water Alternatives* 9(2): 373 - 388.
- Miller, Thaddeus R., Timothy D. Baird, Caitlin M. Littlefield, Gary Kofinas, F. Stuart Chapin and Charles L. Redman (2008). "Epistemological Pluralism: Reorganizing Interdisciplinary Research." *Ecology and Society* 13(2): 46 [online].
- Mirumachi, Naho (2013). "Securitising shared waters: an analysis of the hydropolitical context of the Tanakpur Barrage project between Nepal and India." *The Geographical Journal* 179(4): 309 - 319.
- Mirumachi, Naho (2015). *Transboundary Water Politics in the Developing World*. London, Routledge.
- Mirumachi, N. (2018) *Reflections on enabling conditions through the lens of power asymmetry* Choudhury, E. and Islam, S. *Resolution of Transboundary Water Conflicts: The Role of Enabling Conditions for Pragmatic Negotiation*, Anthem Press, New York. pp. 217-224. ISBN 978-1783088690
- .Molle, Francois and Phillipe Floch (2008). *The "Desert bloom" syndrome: Irrigation development, politics, and ideology in the Northeast of Thailand*. Chiang Mai, Mekong Program on Water, Environment and Resilience, Institut de recherche pour le developpement, International Water Management Institute, MPOWER.
- Moussa, Jasmine (2013). *International Water Law & Allocation in the Nile Basin: A coherent system of law or empty rhetoric?* Presentation given to the UEA Water Security Research Centre, 8 March 2013, University of East Anglia, Norwich, UK.
- Muller, Marc François, Jim Yoon, Steven M. Gorelick, Nicholas Avisse and Amaury Tilmant (2016). "Impact of the Syrian refugee crisis on land use and transboundary freshwater resources." *Proceedings of the National Academy of Sciences* 113(52): 14932-14937.
<https://www.ncbi.nlm.nih.gov/pubmed/27930317>
- NBDF (2011). *Kigali Declaration: Climate change and its implications for Sustainable Development and Cooperation in the Nile Basin*. Kigali, 3rd Nile Basin Development Forum October 2011.
- NBI (2006). *Baseline and Needs Assessment of National Water Policies of the Nile Basin Countries: A Regional Synthesis - Water Policy Component*, Nile Basin Initiative – Water Resources Planning & Management Project
- NBI (2012). *State of the Nile Basin*. Entebbe, Nile Basin Initiative Secretariat.
- NBI (2016). *Nile Basin Water Resources Atlas*. Entebbe, Nile Basin Initiative Secretariat.
- Pernetta, John C. and J. Michael Bewers (2012). "Transboundary diagnostic analysis in international waters interventions funded by the global environmental facility." *Ocean & Coastal Management* 55: 1 - 12.
- Phillips, David (2010). "A Guideline on Benefit Sharing in Trans-boundary Watercourses in the Southern Africa Development Community (SADC)." *unpublished*.
- Phillips, David J.H. , Tony Allan and Melvin Woodhouse (2017). *Writings on QWAF (Quantitative Water Allocative Framework), with narration by Melvin Woodhouse. Promoting Equity, Cooperation and Innovation in the Fields of Transboundary Waters and Natural Resources Management: The Legacy of Dr. David J.H. Phillips*. McCaffrey, S. C., J. S. Murray and M. Woodhouse. Leiden, Brill. 387 - 402.
- Phillips, David and Melvin Woodhouse (2009). *Benefit Sharing in the Nile River Basin: Strategies for Fresh Water Use at the Country and Sub-basin Levels*. Entebbe, Report prepared for the Socio-economic Development and Benefit Sharing Unit of the Nile Basin Initiative.

- Phillips, David and Melvin Woodhouse (2010). Benefit Sharing in the Nile River Basin: Emerging Strategies for Fresh Water Use at the Country and Selected Sub-basin Levels, as Revealed by the Trans-boundary Waters Opportunity Analysis. Windhoek, Nile Basin Initiative, Socio-economic Development and Benefit Sharing component.
- Quba'a, Rola, Mutasem El-Fadel, Majdi Abou Najm and Ibrahim Alameddine (2017). "Comparative assessment of joint water development initiatives in the Jordan River Basin." *INTL. J. RIVER BASIN MANAGEMENT* 15: 115-131.
- Rieu-Clarke, Alistair, Ruby Moynihan and Bjørn-Oliver Magsig (2012). UN Watercourses Convention: User's Guide, IHP-HELP Centre for Water Law, University of Dundee.
- Rimmer, Alon, Amir Givati, Rana Samuels and Pinhas Alpert (2011). "Using ensemble of climate models to evaluate future water and solutes budgets in Lake Kinneret, Israel." *Journal of Hydrology* 410(3-4): 248 - 259.
- Rockström, Johan, Will Steffen, Kevin Noone, Åsa Persson, F. Stuart Chapin, Eric F. Lambin, Timothy M. Lenton, Marten Scheffer, Carl Folke, Hans Joachim Schellnhuber, Björn Nykvist, Cynthia A. de Wit, Terry Hughes, Sander van der Leeuw, Henning Rodhe, Sverker Sörlin, Peter K. Snyder, Robert Costanza, Uno Svedin, Malin Falkenmark, Louise Karlberg, Robert W. Corell, Victoria J. Fabry, James Hansen, Brian Walker, Diana Liverman, Katherine Richardson, Paul Crutzen and Jonathan A. Foley (2009). "A safe operating space for humanity." *Nature* 461: 472 - 475.
- Roe, Paul (2004). "Securitization and Minority Rights: Conditions of Desecuritization." *Security Dialogue* 35(3): 279 - 294.
- Ruettinger, Lukas, Antoine Morin, Annabelle Houdret, Dennis Taenzler and Clementine Burnley (2011). Water, Crisis and Climate Change Assessment Framework (WACCAF), Adelphi Research - Initiative for PeaceBuilding: Early Warning Analysis to Action.
- Sadoff, C.W., J.W. Hall, D. Grey, J.C.J.H. Aerts, M. Ait-Kadi, C. Brown, A. Cox, S. Dadson, D. Garrick, J. Kelman, P. McCornick, C. Ringler, M. Rosengrant, D. Whittington and D. Wiberg (2015). Securing Water, Sustaining Growth: Report of the GWP/OECD Task Force on Water Security and Sustainable Growth. Oxford, University of Oxford.
- Sadoff, Claudia W. and David Grey (2002). "Beyond the river: the benefits of cooperation on international rivers." *Water Policy* 4: 389-403.
- Selby, Jan (2007). Joint Mismanagement: Reappraising the Oslo Water Regime. Water Resources in the Middle East: Israeli-Palestinian Water Issues - From Conflict to Cooperation. Shuval, H. and H. Dweik. Heidelberg, Germany, Springer Verlag. 203 - 212.
- Selby, Jan (2013). "Cooperation, Domination and Colonisation: The Israeli-Palestinian Joint Water Committee." *Water Alternatives* 6(1): 1 - 24.
- Selby, Jan, Omar S. Dahi, Christiane Frölich and Mike Hulme (2017). "Climate change and the Syrian civil war revisited." *Political Geography* 60: 232 - 244.
- Sherman, Martin (1999). The Politics of Water in the Middle East - An Israeli Perspective on the Hydro-Political Aspects of the Conflict. London, UK, Macmillan Press Ltd.
- Siam, Mohamed S. and Elfatih A. B. Eltahir (2017). "Climate change enhances interannual variability of the Nile river flow." *Nature Climate Change* 7(5): 350-354.
- Solow, Andrew R. (2013). "A call for peace on climate and conflict." *Nature* 497(9 May 2013): 179-180.
- Suhardiman, Diana, Dennis Wichelns, Louis Lebel and Sonali Sernaratna Sellamuttu (2014). "Benefit sharing in Mekong Region hydropower: Whose benefits count." *Water Resources and Rural Development* 4: 3 - 11.
- SUSMAQ (2003). Conceptual Flow Model of the West Bank Aquifer Basin, Sustainable Management of the West Bank and Gaza Aquifers, Working Report SUSMAQ-MOD #06 VO.03, Water Resources and Planning Department, Palestinian Water Authority.
- Taylor, Richard (2009). "Rethinking Water Scarcity: The Role of Storage." *Transactions of the American Geophysical Union* 90(28): 237 - 238.
- Thomas, Kimberley Anh (2017). "The Ganges water treaty: 20 years of cooperation, on India's terms." *Water Policy* 19: 724 - 740.
- UEA (2018). Hydro-political Baseline of the Yarmouk Tributary of the Jordan River. Norwich, Water Security Research Centre of the University of East Anglia.
- UNECE (2013). Guide to Implementing the Water Convention. ECE/MP.WAT/39, United Nations Economic Commission for Europe - Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

- UNEP/MAP/MED POL (2005). Transboundary Diagnostic Analysis (TDA) for the Mediterranean Sea. Athens, UNEP / MAP.
- United Nations and World Bank (2018). Pathways for Peace: Inclusive Approaches to Preventing Violent Conflict. Washington, DC, World Bank.
- USACE (1996). Conflict Resolution, Collaboration and Management in International Water Resource Issues. Alternative Dispute Resolution Series, Working Paper #6. Alexandria, USA, US Army Corps of Engineers.
- USAID (2012). Water & Conflict: A Toolkit for Programming. Washington, D.C., US Agency for International Development.
- Väyrynen 1991 in Botes, Johannes (2003). "Conflict Transformation: A debate over semantics or a crucial shift in the theory and practice of peace and conflict Studies?" *The International Journal of Peace Studies* 8(2).
- Warner, Jeroen, Naho Mirumachi, Rebecca L. Farnum, Mattia Grandi, Filippo Menga and Mark Zeitoun (2017). "Transboundary 'hydro-hegemony': 10 years later." *WIREs Water* e01242.
- Weinthal, Erika, Neda Zawahri and Jeannie Sowers (2015). "Securitizing Water, Climate, and Migration in Israel, Jordan, and Syria." *International Environmental Agreements* 15: 293 - 307.
- Wheeler, Kevin G., Mohammed Basheer, Zelalem T. Mekonnen, Sami O. Eltoum, Azeb Mersha, Gamal M. Abdo, Edith A. Zagana, Jim W. Hall and Simon Dadson (2016). "Cooperative filling approaches for the Grand Ethiopian Renaissance Dam." *Water International* 41(4): 611 - 634.
- Wine, Michael L. (2018). "Under non-stationarity securitization contributes to uncertainty and Tragedy of the Commons." *Journal of Hydrology*.
- Woodhouse, Melvin, David Phillips and J. Anthony Allan (not published). "The Quantitative Water Analysis Framework (QWAF): 2. An Example Concerning Fresh Water Management in Mauritius." *Intended to be submitted as an article for Water Policy but never submitted due to sudden illness*.
- World Bank (2009). West Bank and Gaza: Assessment of Restrictions on Palestinian Water Sector Development Sector Note April 2009. Middle East and North Africa Region - Sustainable Development. Report No. 47657-GZ Washington, The International Bank for Reconstruction and Development.
- Zeitoun, Mark (2008). Power and Water: The Hidden Politics of the Palestinian-Israeli Conflict. London, I.B. Tauris.
- Zeitoun, Mark, Ana Cascão, Jeroen Warner, Naho Mirumachi, Nathaniel Matthews, Rebecca Farnum and Filippo Menga (2016). "Transboundary water interaction III: Contesting hegemonic arrangements." *International Environmental Agreements*.
- Zeitoun, Mark, Naho Mirumachi and Jeroen Warner (2011). "Transboundary water interaction II: Soft power underlying conflict and cooperation." *International Environmental Agreements* 11(2): 159 - 178.
- Zeitoun, Mark, Naho Mirumachi and Jeroen Warner (2019). Transforming Water Conflicts. Oxford, Oxford University Press.
- Zeitoun, Mark, Naho Mirumachi and Jeroen Warner (forthcoming 2019). Understanding water conflicts: Analysis for transformation. New York, Oxford University Press.
- Zeitoun, Mark and Jeroen Warner (2006). "Hydro-Hegemony: A Framework for Analysis of Transboundary Water Conflicts." *Water Policy* 8(2006): 435-460.
- Zentner, Matthew (2012). Design and Impact of Water Treaties: Managing Climate Change. Berlin, Springer-Verlag.